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DEPARTMENT OF TRANSPORTATION

STATE OF GEORGIA

INTERDEPARTMENTAL CORRESPONDENCE

FILE MSL00-0004-00(086), Gwinnett Co.
SR 316 FM CR104 to CR 177
PI No. 0004086

OFFICE Materials and Research
Forest Park, Georgia

DATE August 12, 2010

FROM Georgene M. Geary, P.E., State Materials and Research Engineer

TO Bobby Hilliard, P.E., State Program Delivery Engineer
Attn: Hiral Patel

SUBJECT Review of Consultant's Wall Foundation Investigation Report
SR 316 from west of CR104/Collins Hill Rd. to CR177/Hi-Hope Rd.

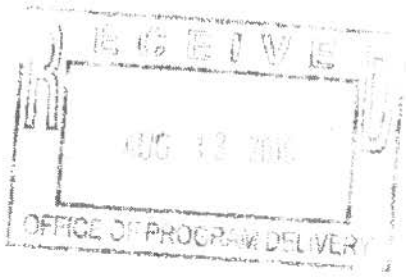
As requested, we have reviewed the Wall Foundation Investigation Report that was written on July 2, 2010 by Willmer Engineering Inc., of Atlanta, Georgia. This report is acceptable for use in design and during construction. Copies of this report should be forwarded to the appropriate DOT offices.

If additional information is needed, please contact Catherine Armstrong of the Geotechnical Engineering Bureau at 404-675-1731.

GMG: CAA

Copy:

Wilmer Engineering Inc.
3772 Pleasantdale Rd., Ste. 165
Atlanta, Georgia 30340-4270
Attention: Kim Duhwan, PhD



RETAINING WALL
FOUNDATION INVESTIGATION REPORT
Reynolds Road Extension
SR 316 from West of CR 104/Collins Hill Rd to CR 177/Hi- Hope Road

GDOT Project No. MSL00-0004-00(086), PI No. 0004086
Gwinnett County, Georgia

WILLMER ENGINEERING INC.
Project No. ATL-171-3594

Prepared For

PBS&J
Atlanta, Georgia

Prepared By

WILLMER ENGINEERING INC.
3772 Pleasantdale Road
Suite 165
Atlanta, Georgia 30340-4270

770.939.0089

WILLMER ENGINEERING INC. | WE

July 2, 2010

VIA HAND DELIVERY

Michael R. Moseley Jr., PE
PBS&J
1600 River Edge Pkwy
Suite 600
Atlanta, Georgia 30328

SUBJECT: **Retaining Wall Foundation Investigation Report**
Reynolds Road Extension
SR 316 from West of CR 104/Collins Hill Rd to CR 177/Hi-Hope Road
GDOT Project No. MSL00-0004-00(086), PI No. 0004086
Gwinnett County, Georgia
Willmer Project No. ATL-171-3594

Dear Mr. Moseley:

Willmer Engineering Inc. (Willmer) is pleased to provide this Retaining Wall Foundation Investigation (WFI) report for the proposed Reynolds Road Extension associated with SR 316 from West of CR 104/Collins Hill Road to CR 177/Hi-Hope Road in Gwinnett County, Georgia. The retaining wall foundation investigation was performed based on a set of plans, profiles and cross sections received on March 19, 2010, provided to us by PBS&J. This work was performed in general accordance with Willmer Proposal No. P04-105B, dated November 4, 2009, and the GDOT guidance documents for retaining wall foundation investigation.

The attached summary presents the site and subsurface conditions along the proposed retaining wall alignment and our geotechnical recommendations related to wall foundation design and construction.

We appreciate the opportunity to be of service to you on this project and look forward to a continuing relationship. Please contact us if you have any questions concerning this report or require further assistance.

Sincerely,
WILLMER ENGINEERING INC.

Murthy S. Kotha
Project Engineer

Sujit K. Bhowmik, PhD, PE
Chief Engineer

James L. Willmer, PE
Executive Vice President/Principal Consultant

MSK/SKB/JLW:ks
P:\3594-SR 316 Colonial Pipeline Gas Easement\Reports\171-3594 - WFI - Draft.doc

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Suite 165
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Attachments: **Retaining Wall Foundation Investigation**

Figures

Figure 1 Project Location Map
Figure 2 Boring Location Plan
Figure 3 Generalized Subsurface Profile – Section A-A'

Appendix I

Boring Record Legend
Unified Soil Classification System Reference Sheet
Engineering Description of Rock Hardness
Boring Logs

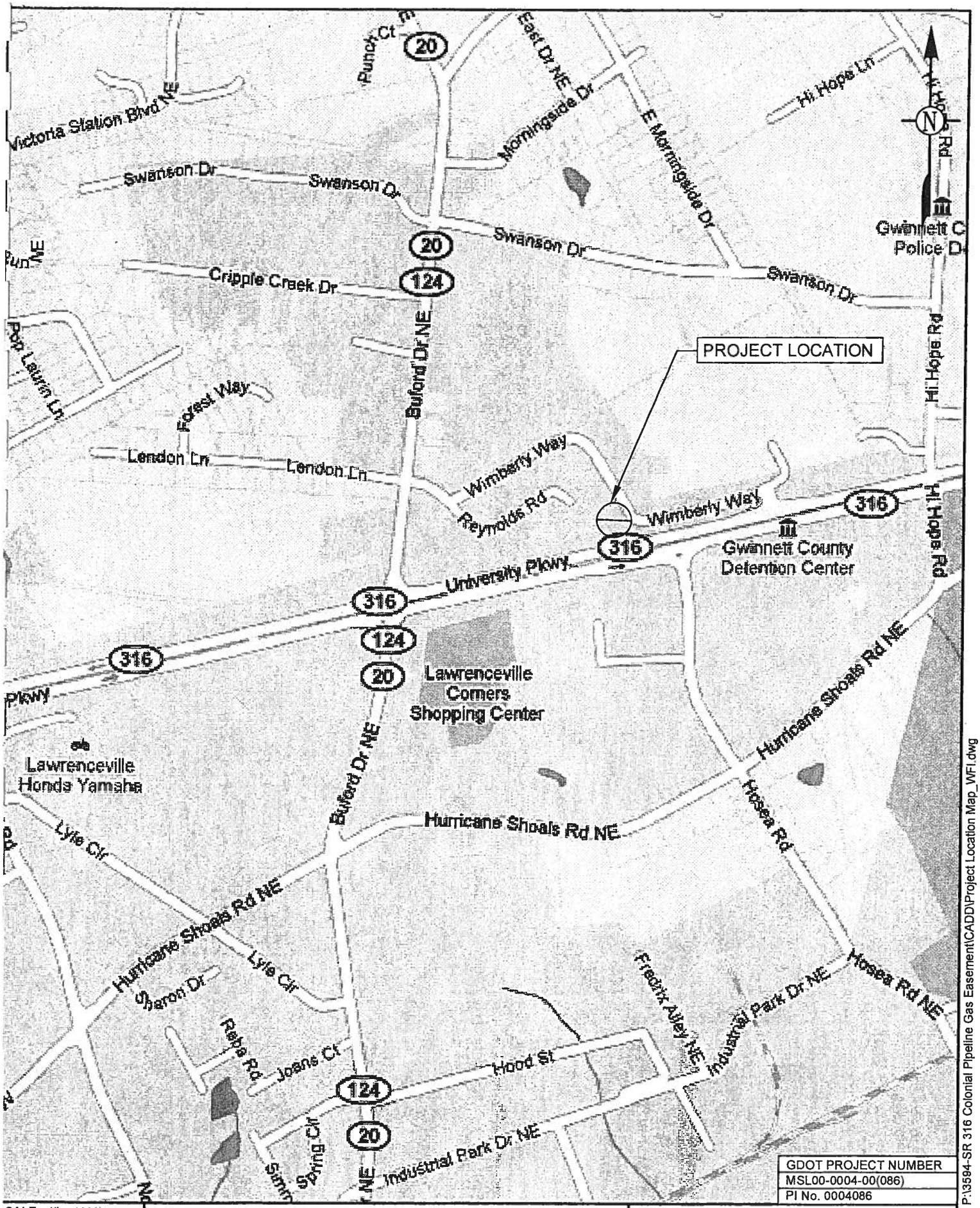
Appendix II

Summary of Triaxial Test Results

RETAINING WALL FOUNDATION INVESTIGATION	
Willmer Project Number	ATL-171-3594
GDOT Project Number	MSL00-0004-00(086)
Project P.I. Number	0004086
Location	Reynolds Road Extension, SR 316 from West of CR 104/Collins Hill Rd to CR 177/Hi-Hope Road, Gwinnett County, Georgia (see Figure 1).
Location and Description	A retaining wall is proposed along Reynolds Road Extension to be constructed as part of SR 316 from West of CR 104/Collins Hill Rd to CR 177/Hi-Hope Road in Gwinnett County, Georgia. The location and alignment of proposed retaining wall are shown in Figures 1 and 2 respectively. The wall extends from approximate Station 71+00 to 73+78.32 along the south side of the proposed Reynolds Road extension. The total length of the proposed wall is about 283.8 feet. The maximum height of the wall is about 11 feet, and the bottom elevation of the wall ranges from about 1061.5 to 1076 feet.
Geologic Information	The project alignment is geologically sited within the Piedmont Physiographic Province of Georgia, and is underlain by mica schist and amphibolite.
Subsurface Features	The subsurface profile along the proposed retaining wall (see boring logs WB-1 through WB-3 and Figure 3) is comprised of fill underlain by residual soils and partially weathered rock. Partially weathered rock was encountered within the boring depth only at boring WB-3. The fill consists of medium dense silty sand. The residuum consists of loose to medium dense silty sand and/or stiff medium to fine sandy silt. Ground water was encountered in borings WB-2 and WB-3 between approximate elevations 1054 and 1056 feet.

Soil Parameters	We understand that GDOT Type 2-C Side Barrier will be used for this retaining wall. The following soil design parameters are recommended for use in the design of the wall: Soil Unit Weight γ = 115 pcf Cohesion c = 0 psf Angle of Internal Friction ϕ = 26 degrees Coefficient of Sliding Friction μ = 0.35 The above design parameters are based on wall backfill material consisting of silty sand/sandy silt compacted to the specified density, and the subgrade prepared as recommended herein. An appropriate safety factor should be used in wall design calculations.
Recommendations	(i) The soil test borings did not encounter any unsuitable materials. However, if soft/loose soils or other unsuitable materials are encountered beneath the proposed wall bottom elevations during construction, they should be over-excavated and replaced No. 57 stone. The depth and extent of any over-excavation should be determined during construction by the Engineer. (ii) The design bearing pressure for the GDOT Type 2-C Side Barrier wall is 3,000 pounds per square foot (psf). The wall subgrade soils are suitable for supporting this bearing pressure. (iii) The backfill materials and drainage measures for the wall should conform to GDOT standard specifications.
Prepared By	Murthy S. Kotha / Sujit K. Bhowmik, PhD, PE
Senior Review By	James L. Willmer, PE

FIGURES



GDOT PROJECT NUMBER
MSL00-0004-00(086)
PI No. 0004086

P:\3594-SR 316 Colonial Pipeline Gas Easement\CADD\Project Location Map_WFI.dwg

CALE: 1" = 1000'
ATE: 6/30/2010
RAWN BY: CDL
EVIEWED BY: DK

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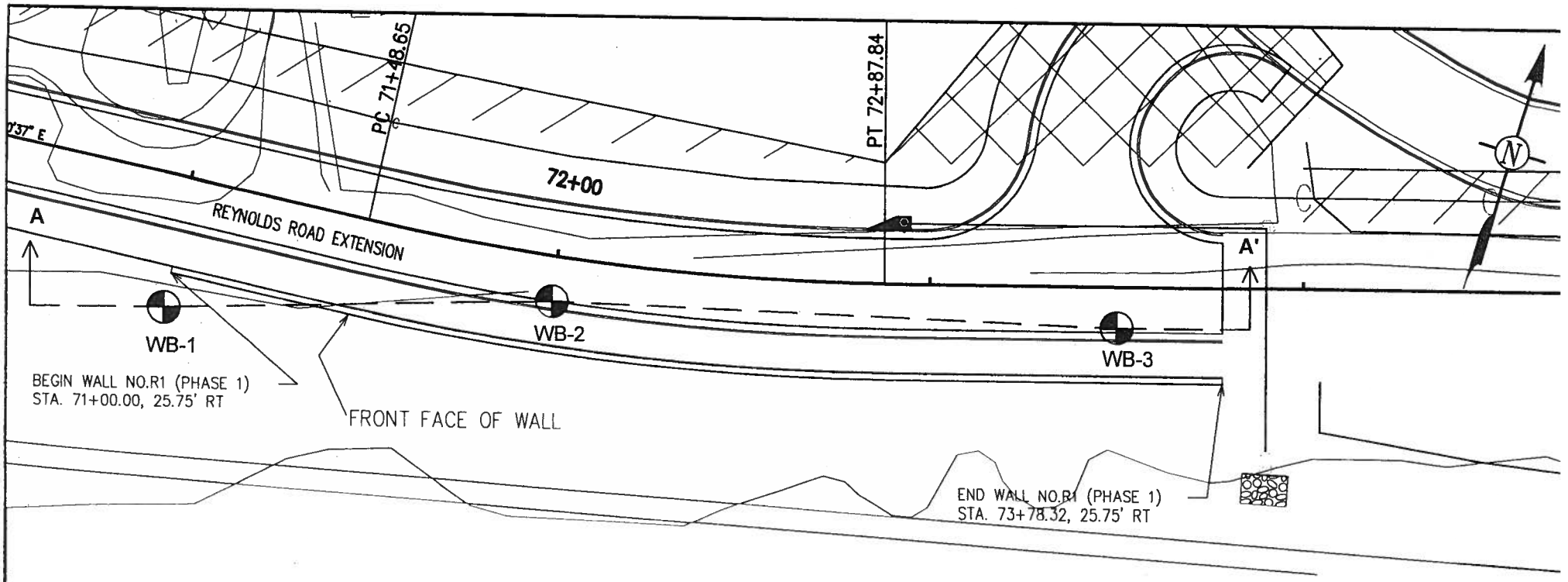
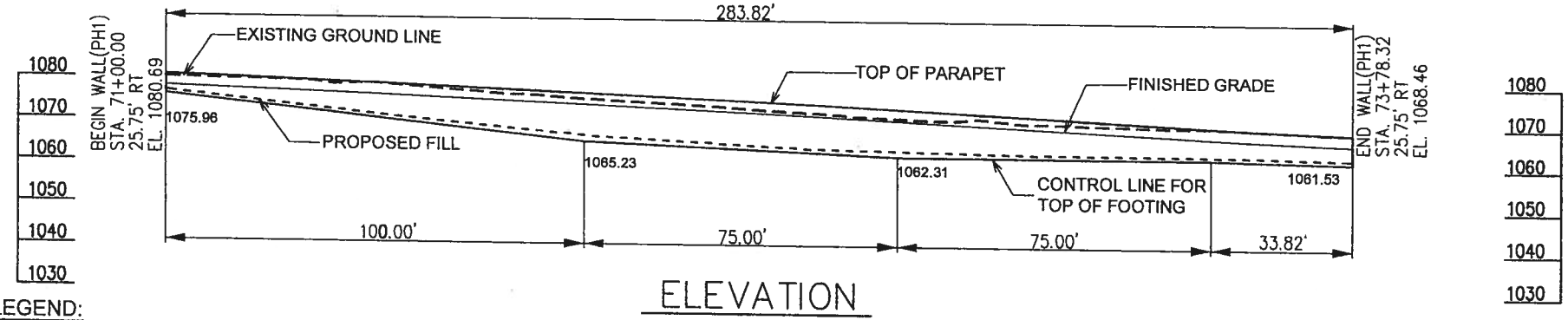
GEOTECHNICAL ENGINEERING
CONSTRUCTION SERVICES
ENVIRONMENTAL SERVICES AND ENGINEERING
3772 PLEASANTDALE ROAD - SUITE 165
ATLANTA, GA 30340-4270

FIGURE 1
PROJECT LOCATION MAP
REYNOLDS ROAD EXTENSION-RETAINING WALL
NO. R1 (SR 316)
GWINNETT COUNTY, GEORGIA
WILLMER PROJECT No. ATL-171-3594



PLAN



ELEVATION

LEGEND:

WB-1 BORING LOCATION

GDOT PROJECT NUMBER
MSL00-0004-00(086)
PI No. 0004086

SCALE: 1" = 40'
DATE: 5/27/2010
DRAWN BY: CDL
REVIEWED BY: MK

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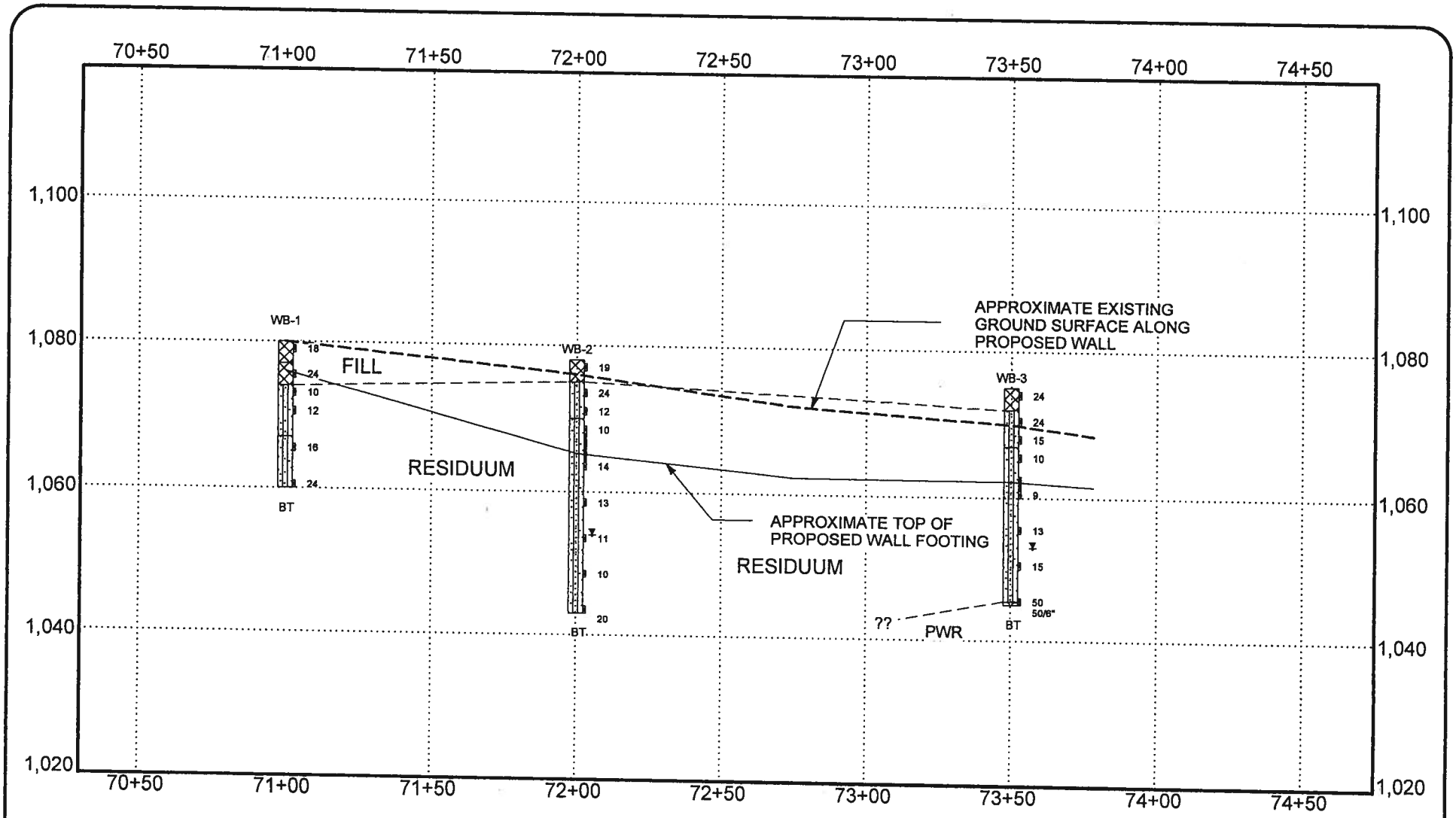
ENVIRONMENTAL SERVICES AND ENGINEERING
3772 PLEASANTDALE ROAD - SUITE 165
ATLANTA, GA 30340-4270

FIGURE 2
BORING LOCATION PLAN
REYNOLDS ROAD EXTENSION - RETAINING WA
NO. R1 (SR 316)
GWINNETT COUNTY, GEORGIA
WILLMER PROJECT No. ATL-171-3594



LEGEND:
- ⧩ - Groundwater Table @ 24 hours
- ⧖ - Groundwater Table @ Time of Boring
- BT - Boring Terminated
- ▮ - Shelby Tube Sample
- PWR - Partially Weathered Rock

SCALE : 1 inch = 20 feet (vertical)
1 inch = 50 feet (horizontal)

GENERALIZED SUBSURFACE PROFILE SECTION A-A'

Reynolds Road Extension - Retaining Wall No. R1
SR 316 FROM WEST OF CR 104/COLLINS HILL RD TO CR 177/HI-HOPE RD
GDOT Project No. MSL00-0004-00(086); PI No. 0004086
Gwinnett County, Georgia

PROJECT #	DATE	FIGURE
171-3594	May 7, 2010	3

APPENDIX I

WILLMER ENGINEERING INC. | WE
Willmer Engineering Inc.
3772 Pleasantdale Road, Suite 165
Atlanta, Georgia 30340

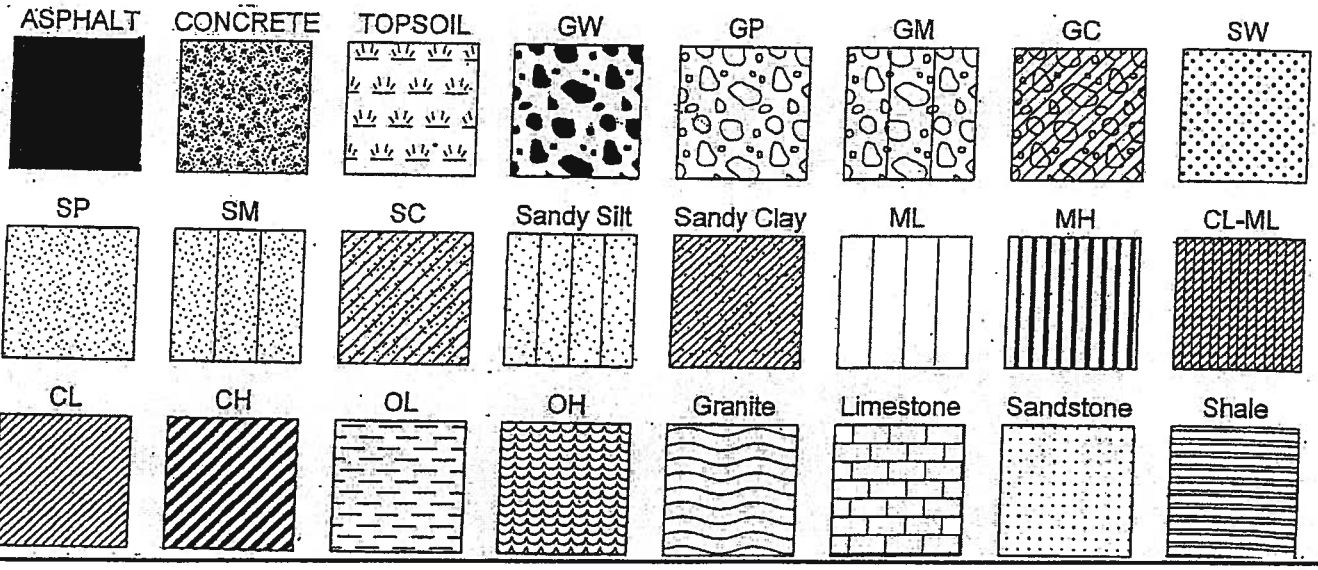
Boring Record Legend

GS- GROUP SYMBOL based on Unified Soil Classification System (Refer ASTM D-2844 and Table 1 of D-2487)

SPT – BLOWS PER FOOT – Standard Penetration Resistance blow count, N, the sum of the second and third 6-inch increments of the SPT test.

CONSISTENCY/RELATIVE DENSITY correlated with SPT blow count:

SILTS AND CLAYS		SANDS	
N, blows per foot	Consistency	N, blows per foot	Relative Density
0 – 2	Very Soft	0 – 4	Very Loose
3 – 4	Soft	5 – 10	Loose
5 – 8	Firm	11 – 30	Medium Dense
9 – 15	Stiff	30 – 50	Dense
16 – 30	Very Stiff	> 50	Very Dense
31 – 50	Hard		
> 50	Very Hard		



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3772 Pleasantdale Road, Suite 165
Atlanta, Georgia 30340

UNIFIED SOIL CLASSIFICATION SYSTEM REFERENCE SHEET

MAJOR DIVISIONS			LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN #200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED #4 SIEVE	CLEAN GRAVELS LITTLE OR NO FINES	(GW)	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
			(GP)	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES APPRECIABLE AMOUNT OF FINES	(GM)	SILTY GRAVELS and GRAVEL-SAND-SILT MIXTURES
			(GC)	CLAYEY GRAVELS and GRAVEL-SAND-CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING #4 SIEVE	CLEAN SAND LITTLE OR NO FINES	(SW)	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
			(SP)	POORLY GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		SANDS WITH FINES APPRECIABLE AMOUNT OF FINES	(SM)	SILTY SANDS and SAND-SILT MIXTURES
			(SC)	CLAYEY SANDS and SAND-CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN #200 SIEVE SIZE	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50		(ML)	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR VERY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			(CL)	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			(OL)	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50		(MH)	INORGANIC ELASTIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS
			(CH)	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			(OH)	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			(PT)	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

WILLMER ENGINEERING INC. | WE

ENGINEERING DESCRIPTION
OF
ROCK HARDNESS

Hardness	Description
Very hard	Cannot be scratched with knife or sharp pick. Breaking of hand specimens requires several hard blows of geologist's pick.
Hard	Can be scratched with knife or pick only with difficulty. Hard blow of hammer required to detach hand specimen.
Moderately hard	Can be scratched with knife or pick. can be excavated by hard blow of point of a geologist's pick. Hand specimens can be detached by moderate blow.
Medium	Can be grooved or gouged 1/16 inch deep by firm pressure on knife or pick point. Can be excavated in small chips to pieces about 1 inch maximum size by hard blows of the point of a geologist's pick.
Soft	Can be gouged or grooved readily with knife or pick point. Can be excavated in chips to pieces several inches in size by moderate blows of a pick point. Small thin pieces can be broken by finger pressure.
Very soft	Can be carved with knife. Can be excavated readily with point of pick. Pieces 1 inch or more in thickness can be broken with finger pressure. Can be scratched readily by fingernail.
Partially Weathered Rock	For engineering purposes, partially weathered rock (PWR) is locally defined as residual soils exhibiting Standard Penetration Test N-values in excess of 50 blows for 6 inches of penetration.

WILLMER ENGINEERING INC. | WE

Project: **Reynolds Road Extension - Retaining Wall No. R1 (SR 316)**
Location: **Gwinnett County, Georgia**
Project Number: **171-3594; GDOT No. MSL00-0004-00(086), PI No. 0004086**

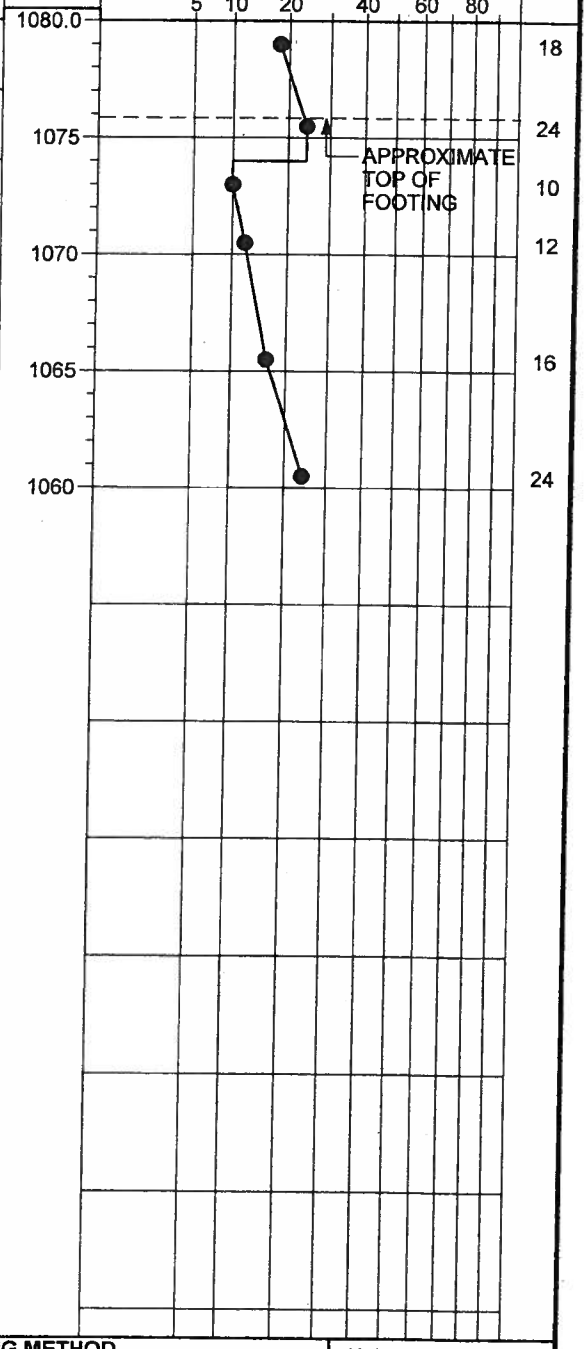
HOLE No. WB-1

Sheet 1 of 1
Location: **See Figure 2**

Azimuth: -- Angle from Horizontal: **90** Surface Elevation (ft): **1080.00** Station: **71+00, 35' Rt**
Drilling Equipment: **CME 45** Drilling Method: **HSA-Manual Hammer**
Core Boxes: **NA** Samples: **6** Overburden (ft): **NA** Rock (ft): **NA** Total Depth (ft): **20.0**
Logged By: **PT** Date Drilled: **4/21/10**

VERTICAL DEPTH (ft)	SAMPLE TYPE	REC%	RQD %	MATERIAL DESCRIPTION	ELEVATION (feet)
0	SS			FILL: Medium dense brown silty medium to fine **SAND** with root and rock fragments — FILL	1080.0
5	SS			Medium dense reddish brown silty medium to fine **SAND** (micaceous) — FILL	1075
	SS			RESIDUUM: Loose to medium dense orange-brown, brown, and reddish brown silty medium to fine **SAND** with rock fragments (slightly micaceous) — SM	
10	SS				1070
				Medium dense light orange, brown, reddish brown, and black silty medium to fine **SAND** (micaceous) — SM	
15	SS				1065
20	SS			Boring was terminated at 20 feet below the existing ground surface.	1060
				Groundwater was not encountered at the time of boring completion.	

STANDARD PENETRATION TEST DATA (blows/foot)



N-VALUE
18
24
10
12
16
24

SAMPLER TYPE
SS - Split Spoon
ST - Shelby Tube
NQ - Rock Core, 1-7/8"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD
HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **WB-1**

SPTN SR316.GPJ 5/21/10

WILLMER ENGINEERING INC.

Project: **Reynolds Road Extension - Retaining Wall No. R1 (SR 316)**
Location: **Gwinnett County, Georgia**
Project Number: **171-3594; GDOT No. MSL00-0004-00(086), PI No. 0004086**

HOLE No. WB-2

Sheet 1 of 1
Location: **See Figure 2**

Azimuth: -- Angle from Horizontal: **90** Surface Elevation (ft): **1078.00** Station: **72+00, 12' Rt**
Drilling Equipment: **CME 45** Drilling Method: **HSA-Manual Hammer**
Core Boxes: **NA** Samples: **11** Overburden (ft): **NA** Rock (ft): **NA** Total Depth (ft): **35.0**
Logged By: **PT** Date Drilled: **4/21/10**

VERTICAL DEPTH (ft)	SAMPLE TYPE	REC%	RQD %	MATERIAL DESCRIPTION	ELEVATION (feet)	N-VALUE
0	SS			FILL: Medium dense tan and brown silty medium to fine **SAND** with root fragments — FILL	1078.0	19
5	SS			RESIDUUM: Medium dense orange-brown and reddish brown silty medium to fine **SAND** (slightly micaceous) — SM	1075	24
	SS					
						12
				Stiff brown medium to fine sandy **SILT** — ML	1070	
10	SS					10
	ST					
	ST				1065	
15	SS					14
					1060	
20	SS					13
					1055	
25	SS					11
					1050	
30	SS					10
					1045	
35	SS			- with rock fragments		20

STANDARD PENETRATION TEST DATA (blows/foot): 5, 10, 20, 40, 60, 80

APPROXIMATE TOP OF FOOTING

Boring was terminated at 35 feet below the existing ground surface.

Groundwater was encountered at 24 feet below the existing ground surface at the time of boring and at 22 feet at 24 hours after boring completion.

Shelby tubes were taken from offset boring at 10-12 feet and 12-14 feet.

SAMPLER TYPE
SS - Split Spoon
ST - Shelby Tube
NQ - Rock Core, 1-7/8"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD
HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **WB-2**

SPTN SR 316.GPJ 5/21/10

WILLMER ENGINEERING INC. | WE

Project: **Reynolds Road Extension - Retaining Wall No. R1 (SR 316)**
Location: **Gwinnett County, Georgia**
Project Number: **171-3594; GDOT No. MSL00-0004-00(086), PI No. 0004086**

HOLE No. WB-3

Sheet 1 of 1

Location: **See Figure 2**

Azimuth: -- Angle from Horizontal: **90** Surface Elevation (ft): **1075.00** Station: **73+50, 11' Rt**

Drilling Equipment: **CME 45** Drilling Method: **HSA-Manual Hammer**

Core Boxes: **NA** Samples: **10** Overburden (ft): **NA** Rock (ft): **NA** Total Depth (ft): **30.0**

Logged By: **PT** Date Drilled: **4/21/10**

VERTICAL DEPTH (ft)	SAMPLE TYPE	MATERIAL DESCRIPTION	ELEVATION (feet)	N-VALUE
0	SS	FILL: Medium dense reddish brown silty medium to fine **SAND** with root and wood fragments	1075.0	24
	SS			24
5	SS	RESIDUUM: Medium dense orange-brown silty medium to fine **SAND** with trace root fragments (slightly micaceous)	1070	15
	SS	Stiff brown medium to fine sandy **SILT**		10
10	ST		1065	
	SS			9
15	SS		1060	
	SS	- with rock fragments	1055	13
20	SS			
25	SS		1050	15
	SS	- becoming dense		
30	SS	PARTIALLY WEATHERED ROCK: Sampled as very dense brown and orange silty medium to fine **SAND** (slightly micaceous)	1045	50/6"

Boring was terminated at 30 feet below the existing ground surface.

Groundwater was encountered at 22 feet below the existing ground surface at the time of boring and at 21 feet at 24 hours after boring completion.

Shelby tube was taken from offset boring at 12-14 feet.

STANDARD PENETRATION TEST DATA (blows/foot): 5 10 20 40 60 80

APPROXIMATE TOP OF FOOTING

SAMPLER TYPE
SS - Split Spoon
ST - Shelby Tube
NQ - Rock Core, 1-7/8"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD
HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **WB-3**

SPTN SR 316.GPJ 5/21/10

APPENDIX II

Table AII-1

Results of Triaxial Test

SR 316 from West of CR 104/Collins Hill Road to CR 177/Hi-Hope Road
GDOT Project No. MSL00-0004-00(086), PI No. 0004086
Willmer Engineering Project No. 171-3594

Consolidated Undrained Triaxial Compression Tests:											
Station and Offset	Location	Boring No.	Sample Depth (feet)	Soil Description	Natural Moisture Content (%)	LL (%)	PI (%)	Fines Content (%)	Effective Consolidation Pressure (lb/ft^2)	Effective Stress Strength Parameters	
										Cohesion Intercept, c (lb/ft^2)	Friction angle, ϕ
72+00 (12 feet Left of Centerline)	Reynolds Road EXT. PH 1	WB-2	11-13	Brown medium to fine sandy SILT	14.5-16.3	43	13	50.7	495-1500	0	26

Abbreviations: LL - Liquid Limit; PI – Plasticity Index